

WHAT IS CLAIMED IS:

1     1. A network system for carrying out communication between a  
2     control station and a plurality of devices connected to a network, wherein  
3     such communication includes data communication which requires real-  
4     time attributes and message communication which does not require real-  
5     time attributes, and wherein the data communication includes a first data  
6     communication in which data is transmitted from the control station to  
7     the devices and data in response to this transmission is transmitted from  
8     the devices to the control station, and a second data communication in  
9     which data is transmitted from the control station at a prescribed timing,  
10    comprising:

11            a plurality of transmission queues for temporarily storing  
12    transmission data provided in the control station, wherein one of the  
13    queues holds transmission data for the second communication;  
14            wherein after the first data communication is carried out in  
15    accordance with a predetermined cycle time, an appropriate switching  
16    between the message communication and the second communication is  
17    carried out in the remaining time of the cycle time to complete one cycle,  
18    whereafter the cycle is repeatedly carried out.

19     2. A network system for carrying out communication between a  
20     control station and a plurality of devices connected to a network, wherein  
21     such communication includes data communication which requires real-  
22     time attributes and message communication which does not require real-  
23     time attributes, comprising:

24            a function provided in the control station for independently  
25    establishing a cycle time for communication;  
26            wherein the established cycle time is referenced at each  
27    communication cycle to determine the current cycle time; and

28        wherein after the data communication is carried out, the message  
29        communication is carried out in the remaining time of the established  
30        cycle time to complete one cycle, whereafter the cycle is repeatedly  
31        carried out.

32        3. A control station for use in a network system for carrying out  
33        communication between the control station and a plurality of devices  
34        connected to a network, wherein such communication includes data  
35        communication which requires real-time attributes and message  
36        communication which does not require real-time attributes, and wherein  
37        the data communication includes a first data communication in which  
38        data is transmitted from the control station to the devices and data in  
39        response to this transmission is transmitted from the devices to the  
40        control station, and a second data communication in which data is  
41        transmitted from the control station at a prescribed timing, comprising:  
42                a plurality of transmission queues for temporarily storing  
43                transmission data, wherein one of the queues holds transmission data for  
44                the second communication; and  
45                control means for extracting appropriate data from the plurality of  
46                transmission queues;  
47                wherein after the first data communication is carried out in  
48                accordance with a predetermined cycle time, the control means carries  
49                out an appropriate switching between the message communication and  
50                the second communication in the remaining time of the cycle time to  
51                complete one cycle, whereafter the cycle is repeatedly carried out.

52        4. The control station of Claim 3, further comprising:  
53                a function for independently establishing the cycle time; and

54           a function for establishing the current cycle time by making  
55   reference to the independently established cycle time at each  
56   communication cycle.

57   5.   A control station for use in a network system for carrying out  
58   communication between the control station and a plurality of devices  
59   connected to a network, wherein such communication includes data  
60   communication which requires real-time attributes and message  
61   communication which does not require real-time attributes, comprising:

62           a function for independently establishing a cycle time;  
63           means for determining the current cycle time by making reference  
64   to the independently established cycle time at each communication cycle,  
65   wherein after the data communication is carried out, the message  
66   communication is carried out in the remaining time of the cycle time to  
67   complete one cycle; and  
68           means for repeatedly carrying out the cycle.

69   6.   A network system for carrying out data communication which  
70   requires real-time attributes and message communication which does not  
71   require real-time attributes, comprising:

72           a control station and a plurality of devices connected to a network;  
73           wherein the control station includes a function to independently  
74   establish the total volume of message data transmitted in the next cycle  
75   during communication; and  
76           wherein the devices carry out communication in manner that does  
77   not exceed the total volume of message communication established by  
78   the control station at each communication cycle.

79   7.   A control station for use in a network system for carrying out  
80   communication between the control station and a plurality of devices  
81   connected to a network, wherein such communication includes data

82 communication which requires real-time attributes and message  
83 communication which does not require real-time attributes, comprising:  
84 a function to independently establish the total volume of message  
85 data transmitted in the next cycle during communication; and  
86 control means which carries out a control process to ensure the  
87 devices carry out communication in manner that does not exceed the total  
88 volume of message communication established by the control station at  
89 each communication cycle.

90 8. A device for use in a network system for carrying out  
91 communication between a control station and a plurality of devices  
92 connected to a network, comprising:  
93 a plurality of transmission queues for temporarily storing  
94 transmission data;  
95 means for storing transmission data in the plurality of transmission  
96 queues;  
97 control means for extracting appropriate data from the plurality of  
98 transmission queues; and  
99 transmission means for transmitting transmission data extracted by  
100 the control means;  
101 wherein at least one of the transmission queues holds transmission  
102 data requiring priority transmission.

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